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**Projected Impact of Decreasing
Department of Defense Budgets and
Consumable Item Transfers on the
Defense Logistics Agency**

July 1991

OPERATIONS RESEARCH AND ECONOMIC ANALYSIS OFFICE



**DEPARTMENT OF DEFENSE
DEFENSE LOGISTICS AGENCY**

Approved for Release 2001/08/01
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Distribution (unclassified)

91-06129



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July 1991

Richard E. Baker

**DEPARTMENT OF DEFENSE
DEFENSE LOGISTICS AGENCY
OPERATIONS RESEARCH AND ECONOMIC ANALYSIS OFFICE
CAMERON STATION
ALEXANDRIA, VA 22304-6100**

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DEFENSE LOGISTICS AGENCY
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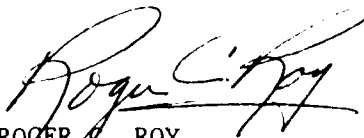


FOREWORD

Accurate predictions of future workload are crucial for effective strategic planning. Cost saving estimates for the Defense Management Review Directives (DRMD) and economic analyses are often based on workload estimates. This study supports DMRD 901 (Reducing Supply System Costs), DMRD 915 (Reducing Transportation Costs), and DMRD 930 (USD(A) DMR Proposals for Defense Agencies) by projecting demand workload for Fiscal Years (FY) 91 to FY 95.

The purpose of this study was to evaluate the impacts of the Consumable Item Transfers mandated by DMRD 926 and impending budget cuts on the Defense Logistics Agency (DLA) demand workload. This study estimated the net effects of the DLA demand workload increases due to the transfer of approximately 961,000 items from the military services to DLA and the demand workload decreases due to reduced national defense budget outlays.

Based on the results of this study, DLA should expect a net increase in demand in terms of constant year FY 90 dollars from FY 90 to FY 93, followed by a slight decline from FY 93 to FY 95. However, these net effects on demand workload vary widely by commodity due to the uneven commodity distribution of the Consumable Item Transfers. The predicted demand workload figures for FY 91 through FY 95 were broken out by center and by year in this study to assist with advance workload planning.


ROGER C. ROY
Assistant Director
Policy and Plans

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EXECUTIVE SUMMARY

The Defense Logistics Agency Supply Operations (DLA-O) Directorate required a method to forecast the impacts of the Consumable Item Transfers (DMRD 926) as well as the Department of Defense (DoD) budget reductions on future DLA demand workload. This study used regression techniques similar to those in the Forecasting Contracting Workload Study [3] and preliminary item transfer statistics to predict annual demand in constant fiscal year (FY) 1990 dollars for the Construction, Electronics, General, Industrial, and Medical commodities.

The Procurement Budget [4] was found to be the best of the demand indicators tested by this study. It could explain 86 percent of the demand variability for these commodities. The Procurement Budget tracked demand well as it increased from FY 81 to FY 85 and as it decreased from FY 85 to FY 90. The Procurement Budget is expected to continue to decline in constant year dollars from FY 90 to FY 95. The decreased DLA demand due to budget cuts, however, is more than offset by the increased demand due to the Consumable Item Transfer.

The combined net effect of the Procurement Budget cuts and the Consumable Item Transfer are expected to increase the center's demand workload from FY 90 to FY 93 for Construction by 26.9, Electronics by 15.6, General by 58.3, and Industrial by 12.1 percent, but decrease Medical demands by 7.8 percent. The net effects of the Consumable Item Transfers and budget cuts are expected to peak by FY 93 at demand levels well below (a 403 million demand dollar decrease from FY 85 to FY 93 in constant year FY 90 dollars) those of FY 85, then continue to decline.

Despite the uncertainties in the Consumable Item Transfer and future budget outlays, the figures in this study would be preferable to assuming constant workload for estimation or planning purposes. However, we recommend that this analysis be updated when additional budget and Consumable Item Transfer data become available.

I. INTRODUCTION

A. Background

The Defense Logistics Agency Supply Operations (DLA-O) Directorate requested that the Immediate Improvements Initiative (I³) Milestone II Benefit Analysis [1] consider the impacts of the Consumable Item Transfers as well as the Department of Defense (DoD) budget reductions. The Milestone I I³ Benefit Analysis [2] assumed constant workload when estimating future benefits. However, with the impending item transfers and budget cuts, constant workload is not a reasonable assumption. The item transfer is expected to increase DLA workload by transferring 961,000 items from the military services to DLA. Budget cuts are expected to reduce workload by reducing military demands.

A 1989 DLA workload forecasting study [3] used single variable linear regression analysis to predict purchase requests, purchase request line item, demand quantity, and demand frequency workload with equipment usage, personnel, and budgetary leading indicators. They were unable to develop statistically viable regression models to forecast purchase requests or purchase request line items. It was found that equipment usage and personnel indicators were not good predictors. However, the Operations and Maintenance (O&M) Budget was found to predict demand quantity for the Medical and the Hardware Commodities (the Construction, Electronics, General, and Industrial Commodities) on a statistically sound basis.

B. Objective. The objective of this study is to determine the impacts of the Consumable Item Transfer and DoD budget cuts on future DLA demand workload.

C. Scope

There were many possible measures of DLA workload. However, for the purpose of this study, DLA workload will be defined in terms of demand. This was deemed to be appropriate since DLA workload is assumed to be related to demand volume.

This study was limited to the Construction, Electronics, General, Industrial, and Medical Commodities. The Textile Commodity was excluded due to poor correlations with the indicators [3]. Subsistence and fuel commodity items were also excluded.

II. METHODOLOGY

A. Indicators

The indicators, or predictors, included the Fiscal Year (FY) 1991 O&M budget, the FY 1991 Procurement Budget, and Air Force Operating Program (Flying Hours). The budgetary figures for FY 1980 to FY 1983 were obtained from the Forecasting Contracting Workload Study [3]. Budgetary figures for FY 1984 through FY 1989 and estimated budgets for FY 1990 through FY 1995 were obtained from the FY 1991 Budget of the United States Government [4].

The budget figures from the workload study and the FY 1991 Budget overlapped for FY 1984 through FY 1990. Figures from the two sources were compared for agreement. Where overlap occurred, the more recent budgetary figures from the FY 1991 Budget were used.

Current year budget dollars were translated into constant FY 1990 dollars using Department of Defense - TOA Deflators [5]. These deflators are necessary to eliminate the effects of inflation when comparing trends over years.

Air Force Operating Program (Flying Hours) for FY 1980 through FY 1987 came from the Forecasting Contracting Workload Study [3]. Flying Hours for FY 1988 through FY 1989 and estimates for FY 1990 through FY 1997 were obtained from the AFLC-MMI DO 41 Computer System. This system tracks the Program Objective Memorandum (POM) flying hour statistics. Where overlap occurred, the more recent figures from AFLC-MMI were used.

B. Demand

The annual demand frequency (ADF), annual demand quantity (ADQ), and annual demand dollar value (AD\$) were obtained from the DLA data extracted from the Standard Automated Materiel Management System (SAMMS) Supply Control Files (SCF). These demand figures exclude cancelled requisitions, but include requirements which were backordered or sent by direct delivery. Deleted items and outliers, items with ADF, ADQ, or AD\$ greater than or equal to 6,000,000, were excluded. FY 1990 demands were estimated using the first three quarters of FY 1990 plus the fourth quarter of FY 1989.

Current year AD\$ equal the ADQ times the current year DLA Standard Unit Price. Current year AD\$ were translated into constant FY 1990 dollars using Department of Defense - Table of Allowance Deflators [5]. Constant FY 1990 dollars were calculated by multiplying the current year dollars by FY 1990 Deflator then dividing by the current year Deflator.

Air Force demand for Air Force managed weapon systems was computed by matching the Materiel Readiness (MARS) weapon files to the MARS requisitions files. Weapon systems with an "F" in the third position of the Weapon System Designator Code were considered Air Force managed weapon systems. Requisitions with an "F" in the first position of the Department of Defense Activity Address Code were considered to be Air Force demands. Air Force contractor, Foreign Military Sales, and Military Assistance Program requisitions were not included in these demand statistics.

C. Regression

Single linear, lagged single linear, multiple linear, and lagged multiple linear regression equations were used to predict demand. Lagged regression was used to determine if the indicators predicted demand well for subsequent time periods of one, two, or three years. For example, a one year lagged single linear regression examined the linear relationship between the Operation and Maintenance (O&M) budget and the ADQ for the following year. Additionally multiple regression was used to determine how well a combination of indicators could predict demand.

Predicted values from the regression equations were plotted against actual values and were also plotted against actual values over time to determine if predictions were biased. The residual (difference between predictions and actual) and observations were tested for normality using Lilliefors' Tests. Residuals were tested for equal variance and for independence by the Residual Variance T-Test, Linear Serial Correlation Test and Monotonic Serial Correlation Test.

D. Item Transfer

A 29 June 1990 Defense Logistics Agency Requirements Branch (DLA-OSR) Inter-Office Memorandum, subject: Defense Management Review (DMRD) #926 - Service Data, indicated the number of items in Phase I of the Item Transfer which will be transferred from the services to each DLA commodity. Approximately 20,000 of the 981,000 items will be transferred to GSA. These 20,000 items were excluded from this analysis. DLA-OSR could not identify which commodities would receive the 85,000 Navy Field Level Repairable Items. These 85,000 items were apportioned to commodities based on the other transferred items.

The actual Item Transfer schedule has not been precisely determined. Consequently, the Item Transfer schedule has been based on information and estimates obtained from DLA Headquarters and DLA Operations Research and Economic Analysis Management Support Office (DORO). The scheduling assumptions are explained in Table 8.

The transferred items were assumed to approximate the same annual demand dollar value as DLA's current items. The services did provide some summary statistics counting items by annual demand dollar value categories. This data could not identify the precise total dollar value for this Item Transfer Demand Analysis, because it was incomplete and too summarized.

E. Net Effects

The net effects of the Item Transfer and budget cuts was calculated by multiplying the proportion of decrease in constant year FY 1990 AD\$ due to budget cuts times the combined constant FY 1990 AD\$ for the current DLA and transferred items. For example, the net effects for FY 1991 was computed as follows:

$$N91 = B91 / C90 * (C90 + T91)$$

WHERE:

N91 - Net annual demand for FY 91 in constant FY 90 dollars

B91 - Annual demand for FY 91 in constant FY 90 dollars due to budget cuts without the Item Transfer.

C90 - Annual demand for FY 90 in constant FY 90 dollars

T91 - Annual demand of items transferred by FY 91 in constant FY 90 dollars

III. ANALYSIS

A. O&M and Procurement Budgets

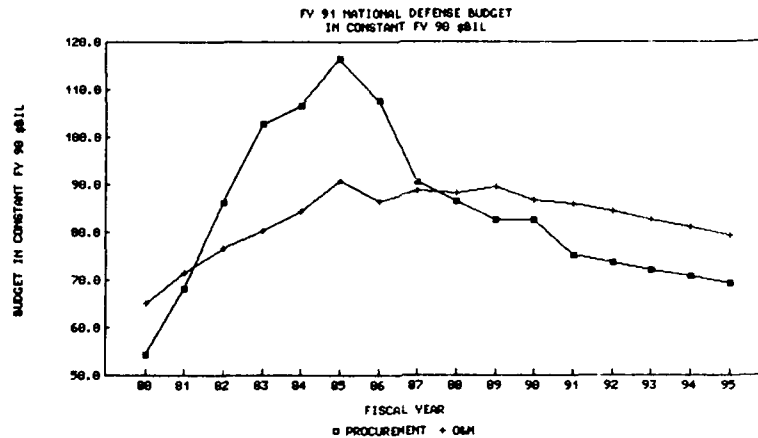
Displayed by Table 1 are the National Defense Budgets as expressed in both current and constant year dollars. Additionally, O&M and procurement deflator factors have been provided. Budget trends, which may be developed from these data for both the O&M and Procurement Budgets (in Constant Year Dollars), indicated that increases were maintained between FY 1981 and FY 1985, while decreases were sustained from FY 1985 through FY 1986. However, at that point in time (FY 1986) the two budgets diverged with procurement continuing to decrease through FY 1995, while O&M smoothed out and remained relatively constant out to FY 1989 before a decreasing mode was resumed (Figure 1).

Table 1

NATIONAL DEFENSE BUDGET FIGURES IN \$BILLIONS

<u>Year</u>	<u>Current Year \$ O&M Budget</u>	<u>Current Year \$ Procure ment Budget</u>	<u>O & M Deflator Factor</u>	<u>Procure ment Deflator Factor</u>	<u>Constant FY 90 \$ O&M Budget</u>	<u>Constant FY 90 \$ Procure ment Budget</u>
80	46.005	35.310	67.51	62.71	65.052	54.291
81	55.548	48.025	74.11	67.90	71.551	68.197
82	62.466	64.462	77.83	72.14	76.616	86.158
83	66.540	80.355	79.24	75.32	80.160	102.805
84	70.974	86.161	80.35	77.84	84.321	106.727
85	77.828	96.842	81.96	80.23	90.647	116.384
86	74.916	92.506	82.82	82.81	86.350	107.710
87	79.607	80.234	85.57	85.46	88.808	90.524
88	81.629	80.053	88.30	89.25	88.248	86.484
89	86.221	79.390	92.04	92.79	89.425	82.496
90	86.761	82.561	95.46	96.42	86.761	82.561
91	90.092	77.855	100.00	100.00	86.002	75.068
92	91.716	78.915	103.88	103.43	84.282	73.567
93	93.169	79.827	107.68	106.76	82.596	72.096
94	94.376	80.670	111.30	110.09	80.945	70.653
95	95.596	81.520	115.04	113.52	79.324	69.238

Figure 1



As mentioned previously, the FY 1987 budget figures used in the Forecasting Procurement Workload Study [3] and the FY 1991 Budget [4] overlapped from FY 1984 to FY 1989. These two sources agreed closely for FY 1984 and FY 1985, but the FY 1987 O&M and FY 1987 Procurement Budgets over-estimated outlays for later years (Table 2). If the FY 1991 Budget also tends to over estimate future outlays, then the actual budget cuts may be more severe than indicated by the current estimates.

Table 2

BUDGETS IN BILLIONS OF CONSTANT FY 1990 DOLLARS

Fiscal Year	O&M FY 87	O&M FY 91	O&M % Change	Procure FY 87	Procure FY 91	Procure % Change
84	84.292	84.321	0.0%	106.727	106.727	0.0%
85	90.618	90.647	0.0%	116.384	116.384	0.0%
86	90.708	86.350	4.8%	113.271	107.710	4.9%
87	96.431	88.808	7.9%	108.060	90.524	16.2%
88	93.582	88.248	5.7%	90.720	86.484	4.7%
89	94.858	89.425	5.7%	98.326	82.496	16.1%

$$\% \text{ CHANGE} = (\text{FY } 87 - \text{FY } 91) / \text{FY } 87$$

B. Demand

Figure 2, Figure 3, Figure 4 and Table 3 tracked total demand (recurring + nonrecurring). ADF was more erratic than ADQ or AD\$. ADF dropped sharply from FY 1987 to FY 1988, then rose from FY 1988 to FY 1989. ADQ and AD\$ in constant FY 1990 dollars followed patterns similar to the FY 1991 Procurement Budget. They increased from FY 1981 to FY 1985, then decreased from FY 1985 through FY 1990.

Figure 2

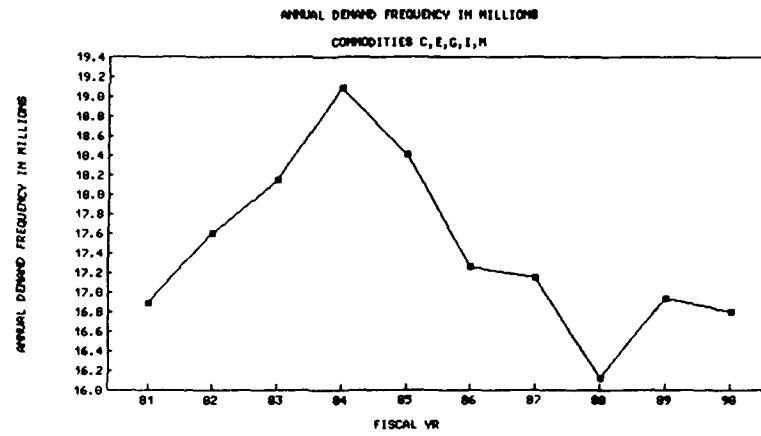


Figure 3

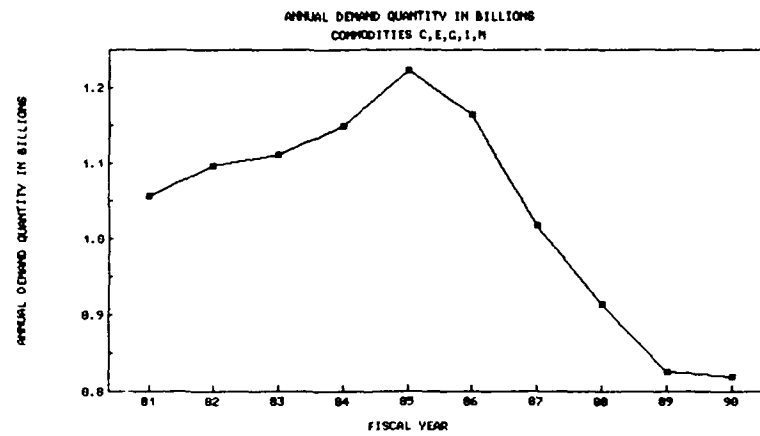
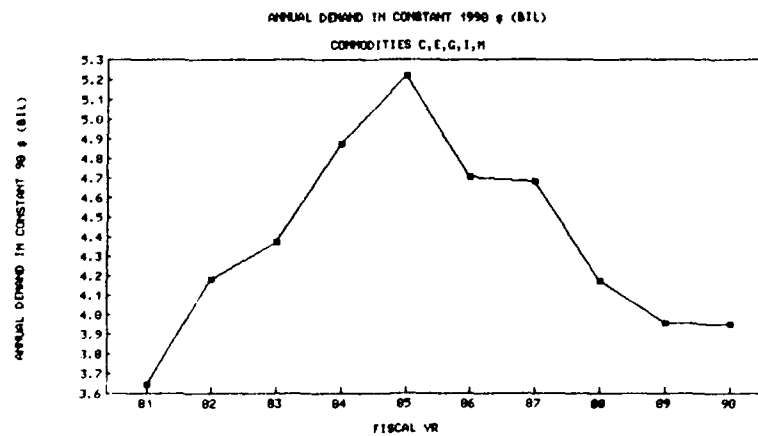


Figure 4



Grand Total Deflator Factors were provided in Table 3 for FY 1980 through 1995. Throughout the rest of this report dollars will be expressed only in constant FY 1990 dollars. These Deflator Factors may be used to translate constant FY 1990 dollars into current dollars. To translate FY 1990 dollars to another year, multiply the FY 1990 dollar figure by the Deflator Factor for the year desired, then divide by the FY 1990 Deflator.

Table 3

DEMANDS FOR COMMODITIES C.E.G.I. AND M

<u>Year</u>	<u>Annual Demand Quantity Billions</u>	<u>Annual Demand Frequency Millions</u>	<u>Current Year Annual Demand \$ Billions</u>	<u>Grand Total Deflator Factors</u>	<u>Constant FY 90 Annual Demand Dollars Billions</u>
80				61.78	
81	1.057	16.888	2.589	68.28	3.647
82	1.096	17.605	3.191	73.40	4.182
83	1.111	18.155	3.460	76.07	4.375
84	1.150	19.089	3.975	78.42	4.876
85	1.222	18.410	4.437	81.82	5.217
86	1.165	17.269	4.109	83.97	4.707
87	1.017	17.151	4.221	86.70	4.683
88	0.915	16.122	3.902	89.91	4.175
89	0.826	16.932	3.841	93.42	3.955
90	0.819	16.804	3.949	96.19	3.949
91				100.00	
92				103.74	
93				107.36	
94				110.88	
95				114.52	

C. Air Force Demands and Flying Hours

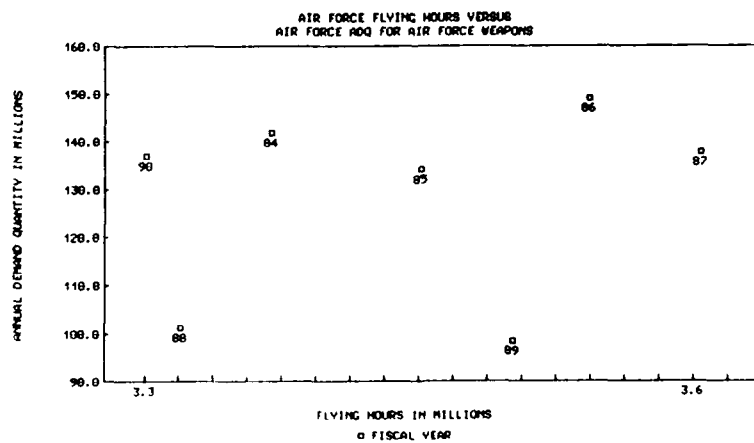
Demand data for Air Force demands for Air Force weapon systems was limited (Table 4). The demand patterns were erratic and did not follow patterns consistent with the Air Force Operating Program Flying Hours (Figure 5).

Table 4

AIR FORCE DEMANDS AND FLYING HOURS

<u>Fiscal</u> <u>Year</u>	<u>AirForce</u> <u>ADQ for</u> <u>AF WS</u> <u>Millions</u>	<u>AirForce</u> <u>Operating</u> <u>Program</u> <u>Flying</u> <u>Hours</u> <u>Millions</u>
80		3.115
81		3.234
82		3.352
83		3.403
84	141.886	3.394
85	134.106	3.481
86	149.010	3.579
87	137.583	3.644
88	101.280	3.341
89	98.515	3.535
90	136.870	3.321
91		3.268
92		3.058
93		2.886
94		2.847
95		2.816
96		2.841
97		2.871

Figure 5



D. Regression

Table 5 summarizes the results of a series of regression analyses. These analyses attempted to fit a straight line equation using one or two indicators to predict demand. These regression equations can be expressed as follows:

For single linear regression:

$$\text{Demand} = \text{Constant} + \text{Coefficient} * \text{Indicator}$$

For multiple regression:

$$\text{Demand} = \text{Constant} + \text{Coefficient (1)} * \text{Indicator (1)} + \text{Coefficient (2)} * \text{Indicator (2)}$$

The "Constant" and "Coefficient" in Table 5 are the values used in the regression equation to predict demand. The "Coefficient" is the weight for the indicator. Examples of regression equations are displayed in Table 6.

The "No. of Observations" row in Table 5 show the number of years of data included in the regression analysis. The "2 YEAR LAG" and "3 YR LAG" analyses had fewer observations because the "2 YR LAG" regression predicted FY 1982 through FY 1990 demand using FY 1980 through FY 1988 indicators while the "3 YR LAG" regression predicted FY 1983 through FY 1990 demand using FY 1984 through FY 1987 indicators.

The "R Squared" in Table 5 is the correlation coefficient squared. "R Squared" reflects the strength of the relationship between the indicators and demand on a scale of 0 to 1. Generally, as the "R Squared" increases, the regression predictions are more accurate. "R Squared" shows the percentage of variance in demand which is accounted for by the indicator. For example, the .86 "R Squared" indicates that 86 percent of the variability of the AD\$ data can be explained by the Procurement Budget. The other 14 percent is unexplained predictive error.

AD\$ could be predicted better than ADQ. Thus, ADQ was dropped. ADF was erratic and was dropped after inspections of the graphs. ADF also had low correlations in the Forecasting Contracting Workload Study [3].

TABLE 5

DLA WORK LOAD REGRESSION ANALYSIS
COMMODITIES C,E,G,I,M

	PROCURS VS ADQ	PROCURS VS ADQ 1 YR LAG	91 O&M \$ VS ADQ	91 O&M \$ VS ADQ 1 YR LAG	PROCURS VS ADS	PROCURS VS ADS 1 YR LAG	PROCURS VS ADS 2 YR LAG	PROCURS VS ADS 3 YR LAG
Constant	0.004307	0.008298	0.014624	0.015155	1.545547	2.470389	3.711254	5.040699
Coefficient	0.000065	0.000023	-0.000050	-0.000058	0.030437	0.021136	0.008198	-0.005990
No. of Observations	10	10	10	10	10	10	9	8
R Squared	0.468153	0.097119	0.049518	0.125552	0.860603	0.689732	0.140799	0.079014

	AF ADQ VS AF FLYING HOURS	AF ADQ VS AF FLYING HOURS 1 YR LAG	AF ADQ VS AF FLYING HOURS 2 YR LAG	AF ADQ VS AF FLYING HOURS 3 YR LAG	91 O&M \$ VS ADS	91 O&M \$ VS ADS 1 YR LAG	91 O&M \$ VS ADS 2 YR LAG	91 O&M \$ VS ADS 3 YR LAG
Constant	0.033024	0.032323	0.030200	0.025245	0.971817	2.846985	4.914709	6.617285
Coefficient	0.000013	0.000017	0.000029	0.000060	0.040393	0.018625	-0.005623	-0.026422
No. of Observations	7	7	7	7	10	10	9	8
R Squared	0.045666	0.057517	0.080296	0.213636	0.269195	0.108833	0.012514	0.266482

	PROCURS & O&M VS ADS	PROCURS & O&M VS ADS 1 YR LAG	PROCURS & O&M VS ADS 2 YR LAG	PROCURS & O&M VS ADS 3 YR LAG
Constant	0.989778	4.337027	7.017066	8.285113
Procurement Budget Coefficient	0.028774	0.033147	0.032782	0.020323
FY91 O&M Budget Coefficient	0.008429	-0.035922	-0.068186	-0.070301
No. of Observations	10	10	9	8
R Squared	0.869755	0.871806	0.714802	0.440963

The regression equations with the three highest "R Squared" values are displayed in Table 6. The O&M Budget contributes very little additional predictive ability in the multiple regression equations. In the "1 YR LAG" equation, the negative coefficient indicates that AD\$ increases as the O&M Budget decreases. Based on evaluation of regression parameters and the predicted values in Table 7, the simpler single linear regression equation using the Procurement Budget was chosen for further analysis.

Table 6

REGRESSION EQUATIONS
CONSTANT YEAR FY 1990 DOLLARS

<u>Equation</u>	<u>Lag, Yrs</u>	<u>R-Square</u>
AD\$ - 1.545547 + 0.030437 * \$PROCUREMENT BUDGET	0	0.860603
AD\$ - 0.989778 + 0.028774 * \$PROCUREMENT BUDGET + 0.008429 * \$O&M BUDGET	0	0.869755
AD\$ - 4.337027 + 0.033147 * \$PROCUREMENT BUDGET - 0.035922 * \$O&M BUDGET	1	0.871806

Table 7

ACTUAL VERSUS PREDICTED ANNUAL DEMANDS
IN CONSTANT FY 90 \$BILLIONS
COMMODITIES C,E,G,I,M

Predictions Based on Regression Equations with FY 1991 Budgets

<u>Year</u>	<u>Actual Annual Demand Dollars</u>	<u>Predicted Based on Procure ment Budget</u>	<u>Predicted Based on Procure & O&M Budgets</u>	<u>Predicted Based on Procure & O&M Budgets 1 Yr Lag</u>
80		3.198	3.100	3.800
81	3.647	3.621	3.555	4.027
82	4.182	4.168	4.115	4.441
83	4.375	4.676	4.625	4.867
84	4.876	4.794	4.771	4.846
85	5.217	5.088	5.103	4.939
86	4.707	4.824	4.817	4.805
87	4.683	4.301	4.343	4.147
88	4.175	4.178	4.222	4.034
89	3.955	4.056	4.117	3.859
90	3.949	4.058	4.097	3.957
91		3.830	3.875	3.736
92		3.785	3.817	3.748
93		3.740	3.760	
94		3.696	3.705	
95		3.653	3.651	

The budget and demand data were tested to determine if the assumptions for the regression analyses were met. The data passed the Linear Serial Correlation, Monotonic Serial Correlation, Lilliefors' Normality of the Observations, and Lilliefors' Normality of the Residuals (prediction errors) Tests. The Procurement Budget data did not have equal variance when tested by a Residual Variance T-Test with a two tailed 0.05 probability level ($T = 15.6727$, $DF = 4$, $P = 0.01036$). The variance (error) was more when the Procurement Budget equaled 90.524 and 102.865 billion dollars (Figure 6). However, the data appeared to fit the linear prediction line well and the prediction errors were not extreme. The Procurement Budget data would pass the Residual Variance T-Test with a two tailed 0.01 probability level.

Figure 6

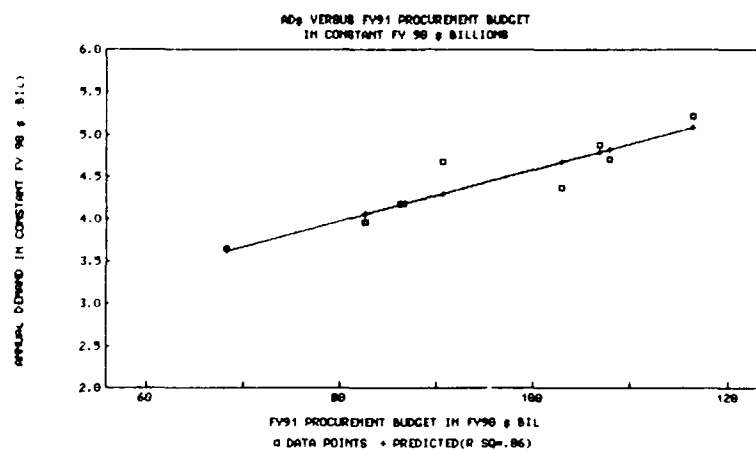
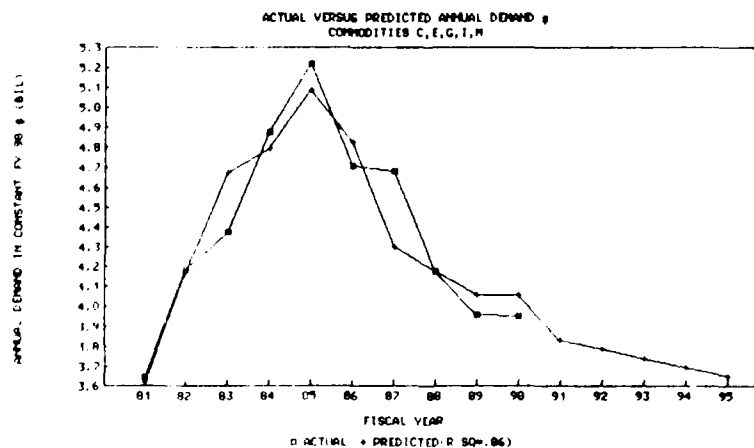


Figure 7 compared actual and predicted AD\$ over time. The predictions tracked actual AD\$ as AD\$ rose from FY 81 to FY 85 and fell from FY 85 to FY 90. Predict AD\$ continued to fall from FY 90 through FY 95.

Figure 7



E. Item Transfer

Tables 8 and 9 display the estimated number of items and AD\$ that will be transferred to DLA. The sources and method of obtaining these numbers was explained in the Methodology section of this report. There is a high degree of uncertainty about the schedule and AD\$.

The Consumable Item Transfer is expected to begin in FY 1991 and continue for a three year period. FY 1991 is expected to have fewer transferred items than FY 1992 and FY 1993 because the Consumable Item Transfer may not begin at the start of FY 1991. Some of the transfer is expected to continue into FY 1994.

The Navy field reparable items were not included in the DMRD #926 service data provided to DLA. Thus, the commodity which will receive these reparable items was not specified. The assumption made for this analysis was that the reparable item commodity distribution will be similar to the other transfer items. For example, if 30 percent of the nonreparable items were allocated to the General commodity, then it was assumed that 30 percent of the reparable items would be allocated to the General commodity.

Table 8

ESTIMATED NUMBER OF ITEMS TRANSFERRED TO DLA
IN PHASE I OF THE ITEM TRANSFER
INCLUDING THE 85,000 NAVY FIELD LEVEL REPARABLES*

<u>Fiscal</u> <u>Year</u>	<u>C</u>	<u>E</u>	<u>G</u>	<u>I</u>	<u>Total</u>
91	49,746	56,081	66,011	47,324	219,161
92	74,619	84,121	99,016	70,986	328,742
93	84,265	94,996	111,817	80,163	371,242
94	9,647	10,875	12,801	9,177	42,500
Total	218,277	246,073	289,645	207,650	961,645

*Assuming 25% of the nonreparable items are transferred in 91 and the balance of nonreparables is split between 92 and 93
field reparable items were assumed to transfer in 93 and 94

As explained in the Methodology Section, the transferred items were assumed to approximate the same annual demand dollar value as DLA's current items. Table 9 assumed the same transfer schedule and commodity apportionment for the Navy reparable items as Table 8.

Table 9

ESTIMATED ANNUAL DEMAND IN MILLIONS OF CONSTANT FY 90 DOLLARS
TRANSFERRED TO DLA IN PHASE I OF THE ITEM TRANSFER
INCLUDING THE 85,000 NAVY FIELD LEVEL REPARABLES*

<u>Fiscal</u> <u>Year</u>	<u>C</u>	<u>E</u>	<u>G</u>	<u>I</u>	<u>Total</u>
91	75.990	38.710	152.152	37.137	303.989
92	113.986	58.065	228.228	55.705	455.983
93	128.722	65.572	257.733	62.907	514.933
94	14.736	7.507	29.505	7.202	58.950
Total	333.434	169.853	667.618	162.951	1333.855

*Assuming that the transferred items have roughly the same annual demand value as DLA

F. Net Effects

As explained in Section II.C, the combined (net) effects in Tables 10, 11 and 12 were calculated by multiplying DLA's overall rate of decrease due to budget cuts times the commodity's current plus transferred workload. The combined (net) effect of budget cuts and the item transfer initially are expected to increase AD\$ workload for the Construction (C), Electronics (E), General (G), and Industrial (I) Commodities, but decrease for the Medical (M) Commodity (Tables 10 and 11). The General Commodity is expected to experience the largest percent net increased AD\$. AD\$ in constant FY 1990 dollars may be 59.5 percent higher in FY 1994 than the AD\$ in FY 1990 for the General Commodity.

Table 10

ESTIMATED DLA ANNUAL DEMAND DOLLARS IN CONSTANT FY 90 BILLIONS OF DOLLARS
ASSUMING NET EFFECTS OF BUDGET CUTS AND THE PHASE I ITEM TRANSFER
INCLUDING THE 85,000 NAVY FIELD LEVEL REPARABLES*

<u>Fiscal</u> <u>Year</u>	<u>C</u>	<u>E</u>	<u>G</u>	<u>I</u>	<u>M</u>	<u>Total</u>
90	0.846	0.637	0.889	0.720	0.856	3.949
91	0.870	0.638	0.982	0.715	0.808	4.014
92	0.966	0.684	1.184	0.758	0.799	4.391
93	1.073	0.736	1.407	0.807	0.789	4.814
94	1.074	0.735	1.417	0.804	0.780	4.811
95	1.062	0.726	1.401	0.795	0.771	4.755

*Assuming that the budget cuts will also affect transferred items

Table 11

PERCENT CHANGE IN ESTIMATED CONSTANT ANNUAL DEMAND DOLLARS FROM FY 1990*

Net Effects of both the Item Transfer and Budget Cuts
by Commodity

<u>Fiscal Year</u>	<u>C</u>	<u>E</u>	<u>G</u>	<u>I</u>	<u>M</u>
91	2.9%	0.1%	10.5%	-0.8%	-5.6%
92	14.2%	7.4%	33.2%	5.3%	-6.7%
93	26.9%	15.6%	58.3%	12.1%	-7.8%
94	27.0%	15.4%	59.5%	11.7%	-8.9%
95	25.5%	14.0%	57.6%	10.4%	-10.0%

*Percent Change in Constant FY90\$ Demand -
(Current Year \$Demand - FY90 \$Demand) / FY90 \$Demand

Tables 12 and 13 compare the isolated effects of the budget cuts without the Item Transfer and the Item Transfer without the budget cuts to the net effects. The budget cuts are expected to decrease AD\$ by 7.5 percent from FY 1990 to FY 1995, while the Item Transfer increases AD\$ by 33.8 percent. The net effect is a 20.4 percent increase in AD\$ for these commodities.

Table 12

ESTIMATED ANNUAL DEMAND IN BILLIONS OF CONSTANT YEAR 90 DOLLARS
FOR COMMODITIES C.E.G.I.M UNDER VARIOUS SCENARIOS

<u>Fiscal Year</u>	<u>Budget Cuts Without Item Transfer</u>	<u>Item Transfer Without Budget Cuts</u>	<u>Item Transfer With Budget Cuts</u>
91	3.830	4.253	4.014
92	3.785	4.709	4.391
93	3.740	5.224	4.814
94	3.696	5.283	4.811
95	3.653	5.283	4.755

Table 13

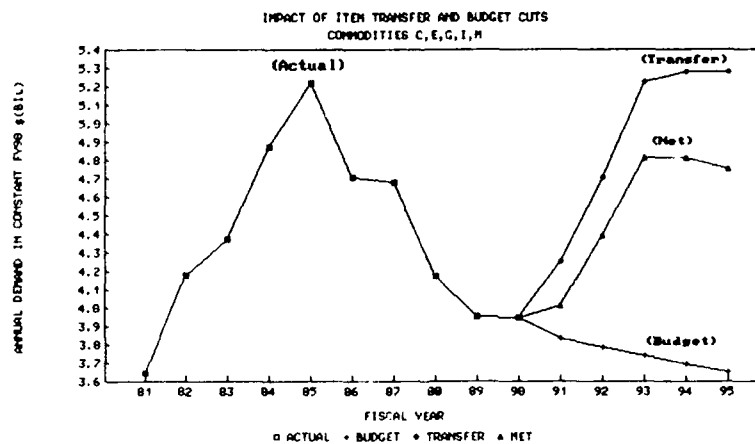
PERCENT CHANGE IN ESTIMATED CONSTANT ANNUAL DEMAND DOLLARS FROM FY 1990
FOR COMMODITIES C,E,G,I,M UNDER VARIOUS SCENARIOS*

<u>Fiscal</u> <u>Year</u>	<u>Budget</u> <u>Cuts</u> <u>Without</u> <u>Item</u> <u>Transfer</u>	<u>Item</u> <u>Transfer</u> <u>Without</u> <u>Budget</u> <u>Cuts</u>	<u>Item</u> <u>Transfer</u> <u>With</u> <u>Budget</u> <u>Cuts</u>
91	-3.0%	7.7%	1.6%
92	-4.2%	19.2%	11.2%
93	-5.3%	32.3%	21.9%
94	-6.4%	33.8%	21.8%
95	-7.5%	33.8%	20.4%

*Percent Change in Constant FY90\$ Demand =
 (Current Year \$demand - FY90 \$demand) / FY90 \$Demand

Figure 8 compared the isolated effects of the budget cuts and the Item Transfer to the net effects and actual historic AD\$ in constant FY 1990 dollars. AD\$ decreased from FY 1985 to FY 1990. The 33.8 percent increase, due to the Item Transfer without considering budget cuts, stabilizes by FY 1994 at levels just slightly higher than the AD\$ of FY 1985. The net effects peak by FY 1993 at levels well below those of FY 1985, then continue to decline.

Figure 8



The Textile Commodity was excluded from this analysis. If we assume that AD\$ Textile workload remains roughly constant, then the overall net effects for Commodities C,E,G,I,M, and T show a 15.8 percent increase from FY 1990 to FY 1995 (Table 14) or a 7.3 percent decrease when FY 1995 compared to the peak year FY 1985 (Table 15). The net demand increase due the Consumable Item Transfer and budget cuts was estimated to be smaller than the demand decrease from FY 1985 to FY 1990.

Table 14

PERCENT CHANGE* IN ESTIMATED CONSTANT ANNUAL DEMAND DOLLARS FROM FY 90
FOR COMMODITIES C.E.G.I.M.T UNDER VARIOUS SCENARIOS**

Fiscal Year	Budget Cuts Without Item Transfer	Item Transfer Without Budget Cuts	Item Transfer With Budget Cuts
91	-2.3%	6.0%	1.3%
92	-3.2%	14.9%	8.7%
93	-4.1%	25.1%	17.0%
94	-5.0%	26.2%	16.9%
95	-5.8%	26.2%	15.8%

*Percent Change in Constant FY90\$ Demand =
(Current Year \$Demand - FY90 \$Demand) / FY90 \$Demand

**Assuming Constant Demand for the Textile Commodity

Table 15

PERCENT CHANGE* IN CONSTANT FY 90 ANNUAL DEMAND DOLLARS FROM FY 85
FOR COMMODITIES C.E.G.I.M.T UNDER VARIOUS SCENARIOS**

Fiscal Year	Budget Cuts Without Item Transfer	Item Transfer Without Budget Cuts	Item Transfer With Budget Cuts
91	-22.0%	-15.3%	-19.1%
92	-22.8%	-8.1%	-13.1%
93	-23.5%	0.1%	-6.4%
94	-24.2%	1.0%	-6.4%
95	-24.8%	1.0%	-7.3%

*Percent Change in Constant FY90\$ Demand =
(Current Year \$Demand - FY85 \$Demand) / FY85 \$Demand

**Assuming Constant Demand for the Textile Commodity

IV. CONCLUSIONS

A. Uncertainty

There is a high degree of uncertainty for the net effect figures, stemming from a variety of sources (e.g., the consumable item transfer and actual budget outlays). Although the range of uncertainty for some of these sources could be estimated, the combined effect of these uncertainties could not be quantified.

There is uncertainty about the accuracy of the Procurement Budget figures, particularly the estimates for FY 1991 through FY 1995. This problem has been observed historically. For example, since the FY 1987 Procurement Budget overstated FY 1989 outlays by 16.1 percent (Table 2), it is probable that the estimates for the FY 1991 Procurement budget may also be overstated.

The slope (regression coefficient) for the procurement regression equation was estimated to equal 0.0304. The 95 percent confidence interval estimates that this coefficient could range as low as 0.0204 or as high as 0.0404. Table 16 displays the lower and upper bounds of the 95 percent confidence interval around the predicted demand dollars.

Table 16

NET EFFECTS OF BUDGET CUTS AND THE PHASE I ITEM TRANSFER
ON DLA ANNUAL DEMAND DOLLARS IN CONSTANT FY 90 BILLIONS OF DOLLARS*

<u>Fiscal</u> <u>Year</u>	<u>Lower 95%</u> <u>Confidence</u> <u>Interval</u>	<u>Predicted</u> <u>Demand</u> <u>Dollars</u>	<u>Upper 95%</u> <u>Confidence</u> <u>Interval</u>
91	4.367	5.154	5.940
92	4.677	5.531	6.385
93	5.026	5.954	6.882
94	5.031	5.951	6.870
95	4.993	5.895	6.796

*Assuming constant demand for the Textile Commodity and assuming that the budget cuts will also affect transferred items.

Transfers include the 85,000 Navy field level reparable.

A major source of uncertainty, however, is the Item Transfer. The number of items transfer is uncertain and could be over stated. Some transferred items may be removed as duplicates. Some items, such as field reparable items and certain special storage requirement items may be retained by the services. The estimates in this study only include Phase I of the Item Transfer. Additional items may also transfer. The transfer schedule and the AD\$ value of these items are also uncertain. Some sources indicated that the AD\$ value of the transfer items tend to be higher than DLA's current items; other sources indicated that they are lower.

The net effect computations assume that the budget cuts will affect the transferred items in a similar manner as DLA items. The transfer items may be affected differently than DLA's current items.

B. Net Effects

The net increase in constant FY 1990 AD\$ from FY 1990 to FY 1995 was estimated to be 20.4 percent for commodities C,E,G,I, and M (Table 13). However, this does not necessarily indicate that the personnel requirements for these commodities will grow by 20.4 percent. Demand growth may not translate linearly to other workload measures [3].

DLA experienced dramatic drops in AD\$ from FY 1985 to FY 1990 (Figure 7). Even with the estimated net growth from FY 1990 to FY 1995, AD\$ are not expected to reach AD\$ levels of FY 1985.

Due to the uneven distribution of the Item Transfer workload across commodities (Tables 8, 9, 10, and 11), it may be necessary to shift personnel across centers. Additional information would be required to determine how workload or personnel should be shifted. Demand workload predictions from this study should not determine the personnel requirements for the centers. This is particularly true for the medical commodity which exhibited substantially higher error rates than the hardware commodities on workload predictions [3].

V. RECOMMENDATIONS

Despite the uncertainties in this analysis, we recommend using these figures for estimation and planning. The figures in this study would be preferable to assuming constant workload for estimation or planning purposes.

We recommend that this analysis be redone when additional budget and Consumable Item Transfer data becomes available. DLA requested and is awaiting detailed Consumable Item Transfer data from the services. When this requested item transfer data is received, commodity assignments and the dollar annual demands for these transferred items can be better estimated. Due to the instability of world events and the history of changes to the budget (Table 2) we recommend that this analysis should be updated with FY 1992 budget figures.

VI. BENEFITS

This study supports DMRD #901 (Reducing Supply System Costs), DMR 915 (Reducing Transportation Costs), and DMR 930 (USD(A) DMR Proposals for Defense Agencies) by projecting demand workload for FY 1991 to FY 1995. Cost saving estimates for the DMRs and economic analyses are often based on workload.

In addition to improving cost and savings estimates, the figures in this study could be used to improve AD\$ predictions for advance workload planning. The budget and Consumable Item Transfer data should be updated, however before finalizing workload plans.

APPENDIX A

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REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
<small>Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.</small>				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE July 1991	3. REPORT TYPE AND DATES COVERED Final	
4. TITLE AND SUBTITLE Projected Impact of Decreasing Department of Defense Budgets and Consumable Item Transfers on the Defense Logistics Agency			5. FUNDING NUMBERS	
6. AUTHOR(S) Richard E. Baker				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) HQ Defense Logistics Agency Operations Research and Economic Analysis Office (DLA-LO) Cameron Station Alexandria, VA 22304-6100			8. PERFORMING ORGANIZATION REPORT NUMBER DLA-91-P00218	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Defense Logistics Agency (DLA-OS, DLA-OM, DLA-CR) Cameron Station Alexandria, VA 22304-6100			10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION / AVAILABILITY STATEMENT Public Release; Unlimited Distribution			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) The purpose of this study was to evaluate the impacts of the Consumable Item Transfers mandated by Defense Management Review Directive 926 and impending budget cuts on the Defense Logistics Agency (DLA) demand workload. This study estimated the net effects of the DLA demand workload increases due to the transfer of approximately 961,000 items from the Military Services to DLA and the demand workload decreases due to reduced national defense budget outlays. Based on the results of this study, DLA should expect a net increase in demand in terms of constant FY 90 dollars from FY 90 to FY 93, followed by a slight decline from FY 92 to FY 95. However, these net effects on demand workload vary widely by commodity due to the uneven commodity distribution of the Consumable Item Transfers. The predicted demand workload figures for FY 91 through FY 95 were broken out by center and by year in this study to assist with advance workload planning.				
14. SUBJECT TERMS Budget, Workload, Item Transfer			15. NUMBER OF PAGES 34	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED	18. SECURITY CLASSIFICATION OF THIS PAGE UNCLASSIFIED	19. SECURITY CLASSIFICATION OF ABSTRACT UNCLASSIFIED	20. LIMITATION OF ABSTRACT	